

Removal of SU-8 Photoresist for Thick Film Applications I: Wet Techniques

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SU8 photoresist has consistently shown excellent resolution in thick film applications, and has been utilized as an electroplating mold. Its sensitivity to UV radiation, then, makes it an ideal candidate for inexpensive alternative to synchrotron-based LIGA. Several drawbacks remain, however, for widespread usage of SU8-based LIGA. Among the problems is that the highly crosslinked epoxy remaining after development is difficult to remove without damage to the electroplated metal.

Two standard solvent mixtures have proven to be particularly successful in our laboratory, Magnastrip (Inland Technologies, Tacoma, WA) and MS-111 (Miller-Stephenson, Danbury, CT). Both solvent systems remove the resist through crazing and peeling rather than dissolution, but will be discussed in detail because these removal techniques can be utilized on very low aspect ratio features, or on parts with no included SU8. A far more reliable alternative is a molten salt bath. The K-10 (Kolene Corp., Detroit, MI) process salt bath is a mixture of sodium nitrate and potassium hydroxide operated at 300-350°C and is efficient at completely oxidizing the highly crosslinked material with little detectable effect on the Ni parts. This inexpensive alternative uses commercial expertise and has been used in our laboratories to make parts several hundred microns thick, typically with complete removal in less than one hour. Sputter Auger depth profiling of metal parts after removal indicates little elemental damage to the metal. Mechanical tensile testing of parts subjected to the salt bath is compared to solvent-removed metal parts.

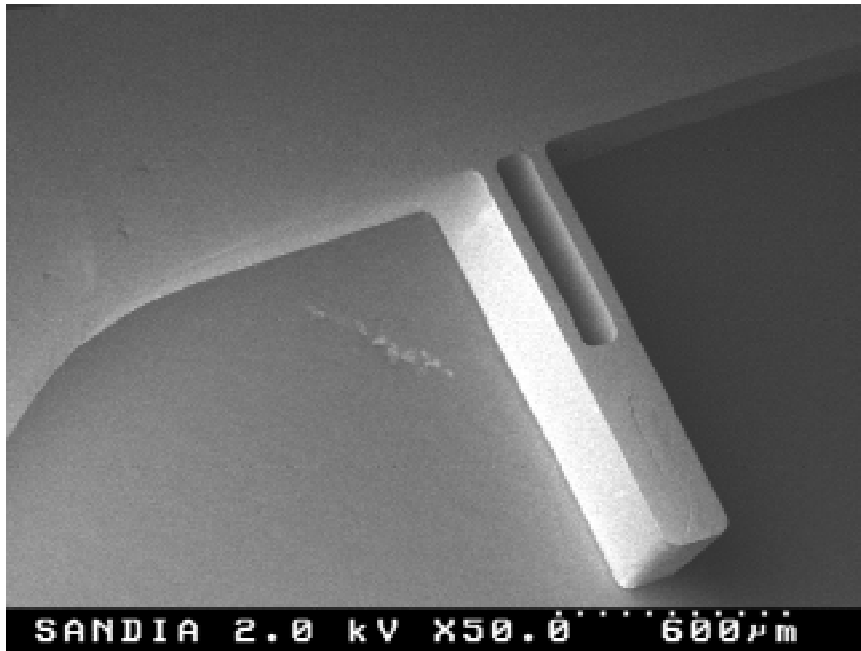


Figure 1: NiFe tensile test part made from SU 8 molds and UV proximity printing. The SU8 mold was 350 µm thick and the SU8 was stripped using a K-10 (Kolene Corp.) molten salt process bath at 320°C in approximately 30 min.

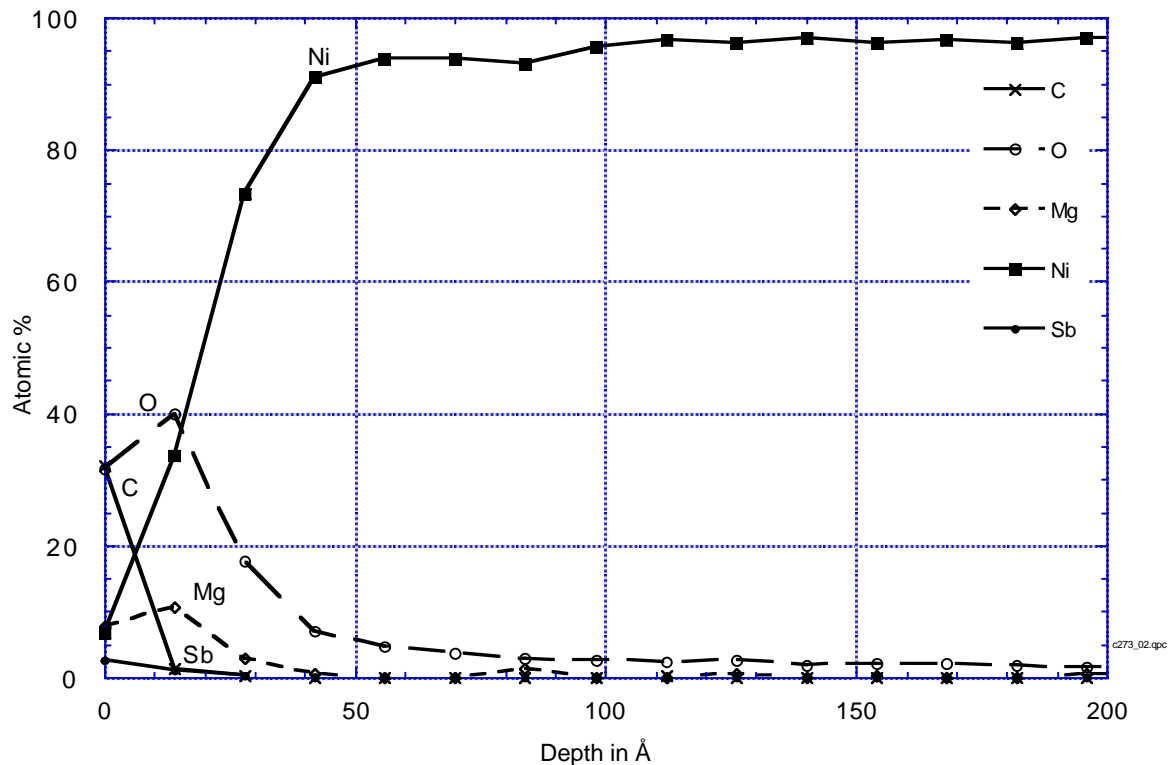


Figure 2: Sputter depth profile of Ni part after 30 min. in K-10 salt bath, and no post cleaning of the part. There is no detectable difference between virgin parts prior to salt bath treatment greater than 20Å into the part. No cleaning step was done prior to sputter Auger except water rinse.